CLAIMS

Sub a1

1. A method for classifying data, the method comprising the steps of:
receiving input data for classification;
defining one or more transformations of the input data;
applying energy minimization to the one or more transforms of the input data;
producing at least a rate of change in energy in response to energy minimization; and
classifying the input data using at least the stress rate value.

2. The method of claim 1 wherein the step of applying energy minimization comprises using individual differences multidimensional scaling applied to the input data.

3. The method of claim 1 wherein the step of applying energy minimization comprises using a finite element method analysis applied to the input data.

4. The method of claim 1 wherein the step of applying energy minimization comprises using simulated annealing applied to the input data.

5. The method of claim 2 further comprising the steps of producing a source space output and classifying the input data using the source space output.

6. The method of claim 2 further comprising the steps of producing a common space output and classifying the input data using the common space output.

7. A classifier process for data comprising:

using individual differences multidimensional scaling with one or more input proximity matrices into which the data to be classified has been converted to produce at least a source space output; and

using the source space output to classify the data.

8. The invention of claim 7 further comprising the step of:

prior to the step of using individual differences multidimensional scaling, producing the one or more proximity matrices from the data to be classified.

9. The invention of claim 7 wherein said step of using individual differences multidimensional scaling also produces a common space output, and wherein the classifier process further comprises the step of:

additionally using the common space output to classify the data.

10. The invention of claim 7 wherein said step of using the source space output to classify the data, is further characterized as comprising the step of:

searching for clustering.

11. The invention of claim 7 wherein said step of using the source space output to classify the data, is further characterized as comprising the step of:

searching for hyperplane discriminators.

12. The invention of claim 7 wherein said step of using the source space output to classify the data, is further characterized as comprising the step of:

searching for decision surfaces.

13. The invention of claim 7 wherein said step of using the source space output to classify the data, is further characterized as comprising the step of:

searching for classifying structures.

14. A classifier process for data comprising:
using individual differences multidimensional scaling with one or more input proximity matrices into which the data to be classified has been converted to produce at least a source space output; and
using the source space output for pattern recognition.

15. A classifier process for data comprising:
using individual differences multidimensional scaling with one or more input proximity matrices into which the data to be classified has been converted to produce at least a source space output; and
using the source space output for sensor fusion.

16. A method for optical character recognition comprising:
using individual differences multidimensional scaling with one or more input proximity matrices into which the data including the characters to be recognized has been converted to produce at least a source space output; and
using the source space output for optical character recognition.

17. A method for data compression comprising:
using individual differences multidimensional scaling with one or more input proximity matrices into which the data to be compressed has been converted to produce at least a source space output; and
using the source space output for data compression.

18. A method for data compression comprising:
producing the one or more proximity matrices including the data to be compressed;

using individual differences multidimensional scaling upon the one or more input proximity matrices to produce a source space output and a common space output; and

using the source space output and the common space output as a compressed representation of the data.

19. A data compression method for data comprising:

using individual differences multidimensional scaling with one or more input proximity matrices into which the data to be compressed has been converted to produce a common space output and a source space output; and

transferring the common space output and the source space output as a compressed representation of the data.

20. A program for classifying data comprised of:

a first program portion that uses individual differences multidimensional scaling with one or more input proximity matrices into which the data to be classified has been converted to produce at least a source space output;

a second program portion that uses the source space output to classify the data.

21. A program for classifying data comprised of:

a first program portion that using individual differences multidimensional scaling with one or more input proximity matrices into which the data to be classified has been converted to produce at least a source space output;

a second program portion that performs an analysis of the source space output; and

a third program portion that classifies the data based upon the analysis performed by the second program portion.

22. Computer executable software code stored on a computer readable medium, the code for classifying input data, the code comprising:

first code that receives the input data and forms one or more matrices using the input data;

second code that applies individual differences multidimensional scaling to the one or more matrices and produces at least a source space; and

third code that uses the source space to classify the input data according to one or more predetermined criteria and produce output data representative of data classification.

23. The computer executable software code of claim 22 wherein the first code forms one or more square matrices.

24. The computer executable software code of claim 22 wherein the first code forms one or more hollow, symmetric matrices.

25. The computer executable software code of claim 22 wherein the input data are time series data and wherein each element of the one or more matrices is a datum from the time series data.

26. The computer executable software code of claim 22 wherein the second code further produces a common space, the third code using both the source space and the common space for classifying the input data.

27. The computer executable software code of claim 22 wherein the second code performs an energy minimization process.

28. The computer executable software code of claim 27 wherein the second code defines a stress σ over configurations of the input data and finds a configuration X_{SK} having a lowest stress.

29. The computer executable software code of claim 28 wherein the second code defines a constraint equation $X_k = ZW_k$ and wherein the second code finds the configuration X_k which also satisfies a constraint equation.

30. The computer executable software code of claim 22 wherein the third code searches for clustering of elements of the source space.

31. The computer executable software code of claim 22 wherein the third code searches for hyperplane discriminators of the source space.

32. A signal processing method comprising the steps of:
receiving input data representative of time varying signals;
mapping the input data into one or more matrices;
applying individual differences multidimensional scaling to the one or more matrices to produce a source space output; and
processing the input data using the source space output.

33. The signal processing method of claim 32 wherein processing the input data comprises separating elements of the source space output using hyperplanes.

34. A signal processing method comprising the steps of:
receiving input data representative of time varying signals;
mapping the input data into one or more matrices;
applying individual differences multidimensional scaling to the one or more matrices to produce a common space output; and
processing the input data using the common space output.

35. The signal processing method of claim 32 wherein processing the input data comprises separating elements of the common space output using hyperplanes.

36. A signal processing method comprising the steps of:
receiving input data representative of time varying signals;
mapping the input data into one or more matrices;
applying individual differences multidimensional scaling to the one or more matrices to produce a rate of change of stress/energy; and
processing the input data using the rate of change of stress/energy.

37. A method for determining dimensionality of a network, the dimensionality corresponding to a number of degrees of freedom in the network, the method comprising the steps of:

sampling data from one or more nodes of the network;

mapping the data into one or more matrices;

applying individual differences multidimensional scaling to the one or more matrices to produce a stress/energy; and

processing the stress/energy to determine the dimensionality of the network.

38. A method for determining dimensionality of a network, the dimensionality corresponding to a number of degrees of freedom in the network, the method comprising the steps of:

sampling data from one or more nodes of the network;

mapping the data into one or more matrices;

applying individual differences multidimensional scaling to the one or more matrices to produce a rate of change of stress/energy output and

processing the rate of change of stress/energy output to determine the dimensionality of the network.

39. A method for determining dimensionality of a network, the dimensionality corresponding to a number of degrees of freedom in the network, the method comprising the steps of:

sampling data from one or more nodes of the network;

mapping the data into one or more matrices;

applying individual differences multidimensional scaling to the one or more matrices to produce a common space output; and

processing the common space output to determine the dimensionality of the network.

40. A method for reconstructing a network, the method comprising the steps of

sampling data from one or more nodes of the network;

mapping the data into one or more matrices;

applying individual differences multidimensional scaling to the one or more matrices to produce a source space output;

from the source space output, determining the dimensionality of the network;

using free nodes to recreate and reconstruct individual nodes through the use of matrices containing missing values; and

establishing node connectivity through the use of lowest-energy connections constrained by dimensionality.

41. A method for determining dimensionality of a dynamical system from partial data, the dimensionality corresponding to a number of degrees of freedom in the dynamical system, the method comprising the steps of:

sampling data from the dynamical system;

mapping the data into one or more matrices;

applying individual differences multidimensional scaling to the one or more matrices to produce a stress/energy;

processing the stress/energy to determine dimensionality of the dynamical system.

42. A method for determining dimensionality of a dynamical system from partial data, the dimensionality corresponding to a number of degrees of freedom in the dynamical system, the method comprising the steps of:

sampling data from the dynamical system;

mapping the data into one or more matrices;

applying individual differences multidimensional scaling to the one or more matrices to produce rate of change of stress/energy output;

processing the rate of change of stress/energy output to determine dimensionality of the dynamical system.

43. A method for determining dimensionality of a dynamical system from partial data, the dimensionality corresponding to a number of degrees of freedom in the dynamical system, the method comprising the steps of:

sampling data from the dynamical system;

mapping the data into one or more matrices;

applying individual differences multidimensional scaling to the one or more matrices to produce a common space output;

processing the common space output to determine dimensionality of the dynamical system.